



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/587,625	05/24/2007	Young Nam Kim	03113.0002.PC/US00	3583
27194	7590	10/15/2010		
HOWREY LLP-CA C/O IP DOCKETING DEPARTMENT 2941 FAIRVIEW PARK DRIVE, SUITE 200 FALLS CHURCH, VA 22042-2924			EXAMINER MARTINEZ, BRITTANY M	
			ART UNIT	PAPER NUMBER
			1734	
			MAIL DATE	DELIVERY MODE
			10/15/2010	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/587,625

**Applicant(s)**

KIM, YOUNG NAM

**Examiner**

BRITTANY M. MARTINEZ

**Art Unit**

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 September 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 2, 4-12, 17-19, 22, 24 and 25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4-12, 17-19, 22, 24 and 25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 15, 2010, has been entered.

### ***Status of Application***

Acknowledgment is made of Applicant's arguments/remarks and amendment, filed September 15, 2010. **Claims 1, 2, 4-12, 17-19, 22, 24 and 25** are pending in the instant application, with **Claims 1, 2, 7-9, 17-19 and 22** amended and **Claims 24 and 25** added. **Claims 3, 13-16, 20, 21 and 23** have been cancelled. **Claims 1, 2, 4-12, 17-19, 22, 24 and 25** have been examined.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. **Claims 2, 9 and 17-19** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

4. With regard to **Claim 2**, it is unclear how requiring the carbon nanofibers to be with or without Y-branched structure further limits “carbon nanofibers.” Further, it is suggested Applicant use separate claims when further limiting both the carbon nanotubes and carbon nanofibers.
5. **Claims 9 and 19** provide for the use of a suspension, but, since the claims do not set forth any steps involved in the method/process, it is unclear what method/process Applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.
6. The portion of **Claim 17** that reads “the pre-treating is selected from the groups consisting of...and acid treatment, and a physical treatment” utilizes improper Markush terminology. See MPEP § 2173.05(h).
7. With regard to **Claim 18**, it is unclear whether there is decomposition, damage or destruction to the surface of the carbon nanofibers.

#### ***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. **Claims 1, 2, 4, 5, 8 and 12** are rejected under 35 U.S.C. 102(b) as being anticipated by Kiricsi et al. (*Proceedings of SPIE*).

10. With regard to **Claims 1, 2, 4, 5 and 12**, Kiricsi discloses a process for preparing Y-branched multi-wall carbon nanotubes comprising the steps of (a) obtaining non-catalyst loaded carbon nanotubes; (b) depositing cobalt salts (loading a catalyst comprising a metal complex comprising at least one metal) on the carbon nanotubes; (c) pre-treating the carbon nanotubes prepared from step (b) to have the catalyst bonded to the surface of the carbon nanotubes; and (d) performing a synthetic reaction of new carbon nanotubes via chemical vapor deposition using the pretreated carbon nanotubes of step (c), at the position where the catalyst is bonded (Kiricsi, Abstract; p. 285, last paragraph – p. 286, “Summary”).

11. With regard to **Claim 8**, while Kiricsi does not explicitly disclose the bonding between the catalyst and the surface of the carbon nanotubes caused by decomposition, damage or destruction of the surface of the carbon nanotubes, the bonding between the catalyst and the surface of the carbon nanotubes of Kiricsi would be caused by decomposition, damage or destruction of the surface of the carbon nanotubes to no less an extent than in the instant application because Kiricsi discloses the same process as that of **Claim 1**.

12. **Claims 1, 2, 4, 5, 7-9, 12, 17-19, 24 and 25** are rejected under 35 U.S.C. 102(b) as being anticipated by Chernozatonskii (*Journal of Nanoparticle Research*).

13. With regard to **Claims 1, 2, 4, 5, 12, 17 and 18**, Chernozatonskii discloses a process for preparing Y-branched two-walled (multi-walled) carbon nanotubes comprising the steps of (a) obtaining non-catalyst loaded carbon nanotubes; (b)

depositing floated nanosize iron particles (loading a catalyst comprising a metal complex comprising at least one metal) on the carbon nanotubes; (c) pre-treating the carbon nanotubes prepared from step (b) to have the catalyst bonded to the surface of the carbon nanotubes; and (d) performing a synthetic reaction of new carbon nanotubes via chemical vapor deposition or pyrolysis using the pretreated carbon nanotubes of step (c), at the position where the catalyst is bonded (Chernozatonskii, Abstract; p. 473, 2<sup>nd</sup> column, last paragraph; p. 474-475; Figure 2; p. 476, 2nd column, last paragraph; p. 477).

14. With regard to **Claims 7 and 17**, Chernozatonskii discloses the bonding between the catalyst and the surface of the carbon nanotubes accomplished by pyrolysis (high temperature treatment) (Chernozatonskii, p. 477).

15. With regard to **Claims 8 and 18**, Chernozatonskii discloses the bonding between the catalyst and the surface of the carbon nanotubes caused by the damage and destruction of the surface of the carbon nanotubes (Chernozatonskii, p. 477).

16. With regard to **Claims 9 and 19**, Chernozatonskii discloses performing the synthetic reaction in a suspension comprising the pre-treated catalyst-loaded carbon nanotubes dispersed in a solvent (Chernozatonskii, Abstract; p. 473, 2<sup>nd</sup> column, last paragraph; p. 474-475; Figure 2; p. 476, 2nd column, last paragraph; p. 477).

17. With regard to **Claims 24 and 25**, Chernozatonskii discloses the suspension floated as drops of fine particles in gas by spraying (Chernozatonskii, Abstract; p. 473, 2<sup>nd</sup> column, last paragraph; p. 474-475; Figure 2; p. 476, 2nd column, last paragraph; p. 477).

***Claim Rejections - 35 USC § 103***

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

19. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

20. **Claims 6-8, 17, 18 and 22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kiricsi et al. (*Proceedings of SPIE*) as applied to **Claims 1 and 2** above.

21. With regard to **Claim 6**, Kiricsi discloses depositing cobalt salts (loading a metal complex catalyst) on the carbon nanotubes (Kiricsi, Abstract; p. 285, last paragraph – p. 286, “Summary”). Impregnation, precipitation, sol-gel method, chemical vapor deposition, sputtering, evaporation, dispersing methods, and spraying methods are all known methods of “depositing.” Thus, to the extent “deposition of cobalt salts” can be interpreted to mean impregnation, precipitation, sol-gel method, chemical vapor deposition, sputtering, evaporation, dispersing methods, or spraying methods, Kiricsi discloses the catalyst loading according to **Claim 6**. In any event, it would have been

obvious to one of ordinary skill in the art to try to modify the process disclosed by Kiricsi with impregnation, precipitation, sol-gel method, chemical vapor deposition, sputtering, evaporation, dispersing methods, or spraying methods because one of ordinary skill in the art could have pursued the known potential catalyst deposition options within his or her technical grasp with a reasonable expectation of success.

22. With regard to **Claims 7 and 17**, while Kiricsi does not explicitly disclose the bonding between the catalyst and the surface of the carbon nanotubes accomplished by the explicitly claimed methods, Kiricsi does disclose the catalyst bonded to the carbon nanotubes (Kiricsi, Abstract; p. 285, last paragraph – p. 286, “Summary”). Thus, it would have been obvious to one of ordinary skill in the art to try to modify the process disclosed by Kiricsi with the explicitly claimed bonding methods because one of ordinary skill in the art could have pursued the known potential bonding method options within his or her technical grasp with a reasonable expectation of success.

23. With regard to **Claims 8 and 18**, while Kiricsi does not explicitly disclose the bonding between the catalyst and the surface of the carbon nanotubes caused by decomposition, damage or destruction of the surface of the carbon nanotubes, the bonding between the catalyst and the surface of the carbon nanotubes of Kiricsi would be caused by decomposition, damage or destruction of the surface of the carbon nanotubes to no less an extent than in the instant application because Kiricsi discloses the same process as that of **Claims 1 and 2**. Still further, Kiricsi discloses the catalytic metal particle in the interior of the side branch of the junction (Kiricsi, Figure 7; p. 286).



This would suggest that the catalyst of Kiricsi did induce some type of decomposition, damage or destruction to the surface of the carbon nanotubes.

24. With regard to **Claim 22**, while Kiricsi does not explicitly disclose repeating the preparation steps, the disclosure of Kiricsi is drawn to multi-branched carbon nanotubes (Kiricsi, Abstract; p. 281; p. 285, last paragraph – p. 286, “Summary”) and thus, it would have been obvious to one of ordinary skill in the art to repeat a process if more of a certain result was desired.

25. **Claims 6, 22, 24 and 25** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chernozatonskii (*Journal of Nanoparticle Research*) as applied to **Claims 1 and 2** above.

26. With regard to **Claim 6**, Chernozatonskii discloses depositing floated nanosize iron particles on the carbon nanotubes (Chernozatonskii, Abstract; p. 473, 2<sup>nd</sup> column, last paragraph; p. 474-475; Figure 2; p. 476, 2nd column, last paragraph; p. 477). Impregnation, precipitation, sol-gel method, chemical vapor deposition, sputtering, evaporation, dispersing methods, and spraying methods are all known methods of “depositing.” Thus, to the extent depositing floated nanosize iron particles can be interpreted to mean impregnation, precipitation, sol-gel method, chemical vapor deposition, sputtering, evaporation, dispersing methods, or spraying methods, Chernozatonskii discloses the catalyst loading according to **Claim 6**. In any event, it would have been obvious to one of ordinary skill in the art to try to modify the process disclosed by Chernozatonskii with impregnation, precipitation, sol-gel method, chemical

vapor deposition, sputtering, evaporation, dispersing methods, or spraying methods because one of ordinary skill in the art could have pursued the known potential catalyst deposition options within his or her technical grasp with a reasonable expectation of success.

27. With regard to **Claim 22**, while Chernozatonskii does not explicitly disclose repeating the preparation steps, the disclosure of Chernozatonskii is drawn to carbon nanotubes with multi-terminal junctions (Chernozatonskii, Abstract; p. 473, 2<sup>nd</sup> column, last paragraph; p. 474-475; Figure 2; p. 476, 2nd column, last paragraph; p. 477) and thus, it would have been obvious to one of ordinary skill in the art to repeat a process if more of a certain result was desired.

28. With regard to **Claims 24 and 25**, Chernozatonskii discloses the suspension floated as drops of fine particles in gas by spraying (Chernozatonskii, Abstract; p. 473, 2<sup>nd</sup> column, last paragraph; p. 474-475; Figure 2; p. 476, 2nd column, last paragraph; p. 477). While Chernozatonskii does not explicitly disclose direct or siphon spraying, it would have been obvious to one of ordinary skill in the art to try to modify the process disclosed by Chernozatonskii with direct spraying, siphon spraying, or atomization because one of ordinary skill in the art could have pursued the known potential floating options within his or her technical grasp with a reasonable expectation of success.

29. **Claims 10 and 11** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chernozatonskii (*Journal of Nanoparticle Research*) as applied to **Claims 1 and 9** above, and further in view of Kishi et al. (US 6,869,581 B2).

30. Chernozatonskii does not disclose the suspension additionally comprising a surfactant (**Claim 10**) selected from the group consisting of non-ionic, anionic, cationic, binary ionic surfactants, carbohydrates, silicones, and fluorocarbons (**Claim 11**). However, the use of surfactants such as sodium dodecylsulfate (an anionic surfactant) in carbon nanotube dispersions is well-known in the art, as evidenced by Kishi (Kishi, c. 8, l. 56-65). Thus, it would have been obvious to one of ordinary skill in the art to modify the suspension of Chernozatonskii with the surfactant of Kishi in order to obtain a uniform dispersion of carbon nanotubes (Kishi, c. 8, l. 56-65).

#### ***Response to Amendment***

Acknowledgment is made of Applicant's amendment, filed September 15, 2010, with regard to the Claims. The Claim Objections and 35 U.S.C. 112, second and first paragraph, rejections of the previous Office action have been withdrawn.

#### ***Response to Arguments***

Applicant's arguments with respect to the instant Claims (Applicant's Response, 9/15/10, p. 5-7) have been considered but are moot in view of the new ground(s) of rejection. It is noted that conventional techniques used to synthesize nanotubes via CVD are deemed obvious to use in the present process; the paucity of references growing tubes-on-tubes should not be taken as an indication otherwise.

#### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRITTANY M. MARTINEZ whose telephone number is

(571) 270-3586. The examiner can normally be reached on Monday-Friday 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

BMM  
/Brittany M Martinez/  
Examiner, Art Unit 1793

/Stuart Hendrickson/  
Primary Examiner, Art Unit 1793